

We Claim

1. A display apparatus, comprising:

a first display structure having a 3-diminsional shape with an interior surface, said first display structure being  
5 configured to display a first image on said interior surface so as to be viewable from a position that is at least partially surrounded by said interior surface; and

a second display structure configured to display a second image on another surface that is viewable from said position  
10 that is at least partially surrounded by said interior surface.

2. A display apparatus according to Claim 1, wherein the first display structure is configured to display an immersion image on said interior surface so as to present  
15 the user with a sense of immersion.

3. A display apparatus according to Claim 1, further comprising a projector configured to project the first image toward the interior surface.

4. A display apparatus according to Claim 3, wherein the  
20 first image projected by the projector being an omnidirectional image captured by an omnidirectional imaging device configured to image surroundings in substantially all directions visible from the omnidirectional imaging device.

5. A display apparatus according to Claim 4, further  
25 comprising the omnidirectional imaging device.

6. A display apparatus according to Claim 4, further comprising:

an omnidirectional-image converting mechanism configured to convert the omnidirectional image into a latitude-longitude image having a rectangular shape on a plane defined by a latitudinal direction and a longitudinal direction;

a correction mechanism configured to correct the latitude-longitude image based on characteristics of the projector; and

a latitude-longitude-image converting mechanism configured to convert the latitude-longitude image after having been corrected by the correction mechanism into the omnidirectional image;

wherein the projector projects the omnidirectional image obtained by the latitude-longitude-image converting mechanism.

7. A display apparatus according to Claim 1,

wherein the second display structure is configured to display a bird's-eye image as viewed from a predetermined viewpoint within said 3-dimensional shape.

8. A display apparatus according to Claim 1, further comprising a projector configured to project the second image from within an interior space that is defined by an inside of the second display structure toward the another

surface.

9. A display apparatus according to Claim 8,  
wherein said second image being of an object, and  
the projector is configured to project said second  
5 image to the another surface for viewing from a  
predetermined viewpoint.

10. A display apparatus according to Claim 9,  
wherein the projector is configured to project said  
second image to the another surface that is viewable from a  
10 viewpoint of the user.

11. A display apparatus according to Claim 10, further  
comprising a viewpoint detector configured to detect the  
viewpoint of the user.

12. A display apparatus according to Claim 9, wherein  
15 the projector is configured to project said second image  
based on the predetermined viewpoint and a shape of the  
another surface on which the second image is displayed.

13. A display apparatus according to Claim 12, wherein  
the projector generates the second image using images  
20 captured respectively by a plurality of imaging devices that  
capture respective images of the object.

14. A display apparatus according to Claim 13, further  
comprising the plurality of imaging devices.

15. A display apparatus according to Claim 13, wherein  
25 the projector comprises:

an image selecting mechanism configured to select a viewpoint image of the predetermined object as viewed from the predetermined viewpoint, based on the predetermined viewpoint, from the images captured by the plurality of imaging devices; and

a viewpoint-image converting mechanism configured to convert the viewpoint image into the second image based on the predetermined viewpoint and a shape of the another surface on which the second image is displayed.

16. A display apparatus according to Claim 15,

wherein the image selecting mechanism is configured to select viewpoint images respectively associated with a plurality of viewpoints of the user,

the viewpoint-image converting mechanism is configured to convert the viewpoint images respectively associated with the plurality of viewpoints of the user so as to generate the second image,

and wherein the second display structure is configured to display the second image as a compilation of images of the predetermined object as viewed respectively from the plurality of viewpoints.

17. A display apparatus according to Claim 15, further comprising:

an integrating mechanism configured to integrate a plurality of viewpoints of the user into an integrated

single viewpoint,

wherein the image selecting mechanism selects viewpoint images respectively associated with the plurality of viewpoints of the user from images respectively captured by the plurality of imaging devices, and generates the viewpoint image for the integrated single viewpoint from the viewpoint images,

and wherein the viewpoint-image converting mechanism converts the viewpoint image for the integrated single viewpoint into the second image.

18. A display apparatus according to Claim 17,

wherein the image selecting mechanism is configured to calculate a weighted sum of the viewpoint images respectively associated with the plurality viewpoints of the user in accordance with distances of the respective viewpoints of the user from the integrated single viewpoint so as to generate the viewpoint image for the integrated single viewpoint.

19. A display apparatus according to Claim 17,

wherein the integrating mechanism is configured to integrate the plurality of viewpoints of the user into a position of a barycenter of the plurality of viewpoints of the user.

20. A display apparatus according to Claim 17, further comprising a viewpoint-distance calculating mechanism

configured to calculate distances among the plurality of viewpoints of the user,

wherein the integrating mechanism is configured to integrate a plurality of viewpoints of the user having  
5 viewpoint distances not greater than a predetermined distance from a single viewpoint.

21. A display apparatus according to Claim 1, wherein at least one of the first display structure and the second display structure includes a hemispherical dome.

10 22. An image processing apparatus for processing images captured from a plurality of positions and generating with a projector a projected image that is projected for display toward an interior display surface having a predetermined 3-dimensional shape, the image processing  
15 apparatus comprising:

an image selecting mechanism configured to select a viewpoint image of a predetermined object as viewed from a viewpoint of a user, based on the viewpoint of the user, from images captured respectively from the plurality of  
20 positions; and

a viewpoint-image converting mechanism configured to convert the viewpoint image into the projected image based on the viewpoint of the user and the predetermined 3-dimensional shape of the interior display surface.

25 23. An image processing apparatus according to Claim 22,

further comprising a detector configured to detect the viewpoint of the user.

24. An image processing apparatus according to Claim 22, further comprising a plurality of imaging devices.

5 25. An image processing apparatus according to Claim 22, wherein:

the image selecting mechanism selects viewpoint images respectively associated with a plurality of viewpoints of the user;

10 the viewpoint-image converting mechanism is configured to convert the viewpoint images respectively associated with the plurality of viewpoints of the user to generate the projected image; and

the display mechanism is configured to display the  
15 projected image so as to display images of a predetermined object as viewed respectively from the plurality of viewpoints of the user.

26. An image processing apparatus according to Claim 22, further comprising an integrating mechanism configured to  
20 integrate a plurality of viewpoints of the user into an integrated single viewpoint,

wherein the image selecting mechanism is configured to select viewpoint images respectively associated with the plurality of user's viewpoints from the images respectively  
25 captured by the plurality of imaging devices, and generate

the viewpoint image for the single viewpoint from the  
viewpoint images,

and wherein the viewpoint-image converting mechanism is  
configured to convert the viewpoint image for the single  
5 viewpoint into the projected image.

27. An image processing apparatus according to Claim 26,  
wherein the image selecting mechanism is configured to  
calculate a weighted sum of the viewpoint images  
respectively associated with the plurality of viewpoints of  
10 the user in accordance distances of the respective  
viewpoints of the user and the integrated single viewpoint  
so as to generate the viewpoint image for the single  
viewpoint.

28. An image processing apparatus according to Claim 26,  
15 wherein the integrating mechanism is configured to  
integrate the plurality of viewpoints of the user into a  
position of a barycenter of the plurality of viewpoints of  
the user.

29. An image processing apparatus according to Claim 26,  
20 further comprising:

a viewpoint-distance calculator configured to calculate  
distances among the plurality of viewpoints of the user,

wherein the integrating mechanism is configured to  
integrate a plurality of viewpoints of the user having  
25 viewpoint distances not greater than a predetermined



distance into an integrated single viewpoint.

30. An image processing method for processing images captured from a plurality of positions and generating a projected image projected by a projector toward a display

5 surface, the image processing method comprising steps of:

selecting a viewpoint image of an object according to a viewpoint of a user, based on the viewpoint of the user, from the images captured respectively from the plurality of positions; and

10 converting the viewpoint image into the projected image based on the viewpoint of the user and a shape of the display surface.

31. A program for execution by a computer to perform image processing for processing images captured from a  
15 plurality of positions and generating a projected image projected by a projector toward a display surface configured to having an image displayed thereon, the program comprising instructions that cause the computer to implement steps of:

20 selecting a viewpoint image of an object according to a viewpoint of a user, based on the viewpoint of the user, from the images captured respectively from the plurality of positions; and

25 converting the viewpoint image into the projected image based on the viewpoint of the user and a shape of the display surface.

32. An imaging apparatus for capturing an image,  
comprising:

omnidirectional imaging means for obtaining an image  
surroundings in all directions; and

5        object-imaging means for obtaining an image of an  
object from a plurality of directions.

33. An imaging apparatus according to Claim 32,

wherein an image obtained by the omnidirectional  
imaging means includes means for displaying an immersion  
10 image for presenting a user with a sense of immersion,

and wherein an image obtained by the object-imaging  
means includes means for displaying a bird's-eye image of  
the object as viewed from a viewpoint of the user.